HISTORIA MATHEMATICA **19** (1992), 444–456

ABSTRACTS

Edited by DAVID E. ZITARELLI

The purpose of this department is to give sufficient information about the subject matter of each publication to enable users to decide whether to read it. It is our intention to cover all books, articles, and other materials in the field.

Books for abstracting and eventual review should be sent to this department. Materials should be sent to Prof. David E. Zitarelli, Department of Mathematics, Temple University, Philadelphia PA 19122, U.S.A. (e-mail: V5319E @ TEMPLEVM. BITNET or V5319E @ VM.TEMPLE.EDU)

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In order to facilitate reference and indexing, entries are given abstract numbers which appear at the end following the symbol #. A triple numbering system is used: the first number indicates the volume, the second the issue number, and the third the sequential number within that issue. For example, the abstracts for Volume 17, Number 1, are numbered: 17.1.1, 17.1.2, 17.1.3, etc.

For reviews and abstracts published in Volumes 1 through 13 there are an *author index* in Volume 13, Number 4, and a *subject index* in Volume 14, Number 1.

The initials in parentheses at the end of an entry indicate the abstractor. In this issue there are abstracts by Ivor Grattan-Guinness (Herts), R. C. Gupta (Ranchi), Albert C. Lewis (Hamilton), Ivica Martinović (Dubrovnik), and David E. Zitarelli.

ALEKSANDROVA, N. V., AND TRUPANOVA, V. M. 1989. On the concept of linear independence. [In Russian] Pp. 3–10 in #19.4.5. The history of the concept of LINEAR INDEPENDENCE in the 19th century from the quaternions of Hamilton to the 1901 paper of Bôcher, including applications to DIFFERENTIAL EQUATIONS and TENSOR ANALYSIS. (DEZ) #19.4.1

ALEKSEEVA, N. B. 1989. On the history of finite fields. [In Russian] Pp. 11–16 in #19.4.5. The development of FINITE FIELDS from Gauss in 1801 to Steinmetz in 1910. Two methods of construction are compared, the approach of Galois via an imaginary unit and the double module construction of Serret. ALGEBRA. (DEZ) #19.4.2

ANDERSON, PHILIP W. *See* #19.4.23.

ANTROPOV, A. A. 1989. The history of the concept of the genus of a binary quadratic form. [In Russian] Pp. 17–27 in #19.4.5. An examination of the work of Euler as a precursor to the work of Gauss on BINARY QUADRATIC FORMS. ALGEBRA. (DEZ) #19.4.3

ARCHIBALD, TOM. 1992. CSHPM in Charlottetown. *International Study Group on the Relations Between the History and Pedagogy of Mathematics Newsletter* **26,** 8–9. Report of a meeting of the Canadian Society for the History and Philosophy of Mathematics held May 28–29, 1992, in Charlottetown. Abstracts of four papers. (DEZ) #19.4.4

ARMAND, R. *See* #19.4.31.

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BASHMAKOVA, I. G., RYBNIKOV, K. A., AND TYULINA, I. A. (Eds.) 1989. *The history and methodology of the natural sciences. Volume 36. Mathematics, mechanics.* Moscow: Moscow Univ. Publishing House. 196 pp. 3 r. 50 k. A collection of 23 papers on the history of mathematics and MECHANICS, all of which are abstracted separately. (DEZ) #19.4.5

BERG, C., AND LÜTZEN, J. 1990. J. Liouville's unpublished work on an integral operator in POTENTIAL THEORY. A historical and mathematical analysis. *Expositiones Mathematicae* **8**(2), 97–136. Investigations by LIOUVILLE recorded in his notebook for 1846 preceded by several decades work by others on a "Fredholmian" SPECTRAL THEORY for integral operators and a "Rayleigh–Ritz" method for the calculation of EIGENVALUES. Liouville was also aware of the problems associated with the foundation of Dirichlet's principle. Reviewed by D. Laugwitz in *Zentralblatt* 695:01008. (ACL) #19.4.6

BHATTACHARYA, B. B. 1988. A discussion about some discrepant or obscure formulae in mathematics: European and Indian. *Journal of the Asiatic Society* **30,** 161–171. (RCG) #19.4.7

BIDWELL, J. K. 1988. Arithmetic of Mayan civilization. *Mathematics Today* **6**(1), 37–41, 46. MAYA. (RCG) #19.4.8

BIER, MARTIN. 1992. A Transylvanian lineage. *The Mathematical Intelligencer* **14**(2), 52–54. The author locates the towns of Cluj and Tîrgu Mureş in Romania, where FARKAS BOLYAI and his son JANOS BOLYAI lived. He describes their grave sites and the museum devoted to them. Photographs. (DEZ) #19.4.9

BRYLEVSKAYA, L. I. 1989. On the discussion about the existence of non-measurable sets. [In Russian] Pp. 28–33 in #19.4.5. An examination of the debate concerning examples of sets of real numbers that are not Lebesgue-measurable that arose among Vitali, Van Vlek, Luzin, and Lebesgue. REAL ANALYSIS. MEASURE THEORY. (DEZ) #19.4.10

BÜHLER, W. K. 1989. *Gauss. Biograficheskoe issledovanie.* Moscow: Nauka. 208 pp. 1 r. Russian translation from the English by S. G. Gindikin. This biography of GAUSS was also published in German in 1987. The original edition of 1981 is abstracted in *Historia Mathematica* **8,** 490 (#1774). *Zentralblatt* 696:01006.(ACL) #19.4.11

BURN, R. P. 1992. Irrational numbers in English language textbooks, 1890–1915: Construction and postulates for the completeness of the real numbers. *Historia Mathematica* **19**(2), 158–176. The first works in English on constructing real numbers from rationals via Cauchy sequences or Dedekind cuts appeared in 1890. This paper documents the 25-year transition to the appearance of this material in TEXTBOOKS, discusses the fact that such publications occurred in the UNITED STATES before the UNITED KINGDOM, and explains the lack of communication between the two countries. REAL ANALYSIS. (DEZ) #19.4.12

BUTZER, PAUL, LOHRMANN, DIETRICH, AND FALKENSTEIN, LUDWIG. 1992. 4. Aachener Alcuin Symposium. Science and history in western and eastern civilization, 8th and 9th centuries. *Historia Mathematica* **19**(2), 208–209. A list of lecturers, with titles of their presentations, from a symposium held September 25–28, 1991, in Aachen, Germany, that dealt with the state of art of the mathematical sciences in the Latin West, Byzantium, and the Muslim world in the time of ALCUIN OF YORK. (DEZ) #19.4.13

CAMPOS, HUGO BARRANTES, AND ZÚÑIGA, ANGEL RUIZ. 1990. El programa de matemáticas del año 1964: Un balance [The program of mathematics from 1964: A balance]. Pp. 395–402 in #19.4.110. An analysis of the ideas contained in a document written for the Comision Redactora on programs begun in 1964 to reform MATHEMATICS EDUCATION in COSTA RICA. (DEZ) #19.4.14

CAMPOS, HUGO BARRANTES, AND ZÚÑIGA, ANGEL RUIZ. 1990. Evolución de los programas de matemáticas para la Enseñanza Media en Costa Rica [Evolution of programs in mathematics for an average education in Costa Rica]. Pp. 385–394 in #19.4.110. A sketch of the history of modern public EDUCA-

TION in COSTA RICA that divides the 20th century into two periods separated by the educational reform of 1964 that was part of a worldwide movement. (DEZ) #19.4.15

CHAKI, M. C. 1988. On an attempt in India to prove Euclid's fifth postulate. *Journal of the Asiatic Society* **30**, 77–111. INDIA. GREEK GEOMETRY. (RCG) #19.4.16

CHARPENTIER, MARC. 1989. Idéaux et géométrie: Une esquisse historique. *Séminaire de Mathématique de Luxembourg, Travaux Mathématiques* **1**, 1–13. A sketch of the notion of an IDEAL and its role in ALGEBRAIC GEOMETRY beginning with Kummer in 1847. Special emphasis is given to the work of KRONECKER, and that of DEDEKIND and WEBER. Also included are Lamé, Dirichlet, Steinitz, Fraenkel, Lasker, E. Noether, and others. *Zentralblatt* 695:01009. (ACL) #19.4.17

CHATTERJEE, DIPAK. 1990. The Scottish book–A mathematical legend. *News Bulletin of the Calcutta Mathematical Society* **13**(5), 13–14. (RCG) #19.4.18

CHIBA, MARTA. *See* #19.4.91.

CHRISTIANIDIS, JEAN. *See* #19.4.37.

CORDERO, JUAN BOZA. 1990. Módulos: La evolución de un concepto [Modules: The evolution of a concept]. Pp. 294–303 in #19.4.110. An account of various ways to regard MODULES depending on their context. Their role in REPRESENTATIONS OF GROUPS during the 1970s and 1980s by L. Auslander and I. Reiten is elucidated. (DEZ) #19.4.19

CROSSLEY, J. N. *See* #19.4.91.

DADIĆ, ŽARKO. 1991. *Exact sciences in medieval Croatia.* [In Croatian] Zagreb: Globus. 198 pp. History of MATHEMATICS, ASTRONOMY, ASTROLOGY, and PHYSICS among Croats from the 7th century to 1526. Includes chapters on the greatest scientific figures: HERMAN DALMATIN (Hermannus Dalmata, 12th century), PETAR PAVAO VERGERIJE (Petrus Paulus Vergerius, Kopar, 1370–Budim, 1444), IVAN VITEZ of Sredne (Ioannis de Zredna, Sredna, 1405–Esztergom, 1472), GJIN GAZULLI (Johannes Gazulus, ?–Dubrovnik, 1465), IVAN ČESMIČKI (Janus Pannonius, Česmica, 1434–Medvedgrad, 1472), JURAJ DRAGIŠIĆ (Georgius Benignus de Salviatis, Srebrenica, ab. 1445–in Italy, 1520), and FEDERIK GRIZOGONO (Federicus Chrisogonus, Zadar, 1472, –Zadar, 1538). CROATIA. (IM) #19.4.20

DADIĆ, ŽARKO. 1991. Mathematical views in 16th century DUBROVNIK. [In Croatian] *Anali Zavoda za povijesne znanosti HAZU u Dubrovniku* **29**, 117–120. An understanding of mathematics in the Aristotelian sense can be found in *Dialogo sopra la sfera del mondo* (1579) by NIKOLA NALJEŠKOVIĆ (Nicolo di Nale, Dubrovnik, ab. 1510–1587), and a derivation of the concept of beauty from an understanding of mathematics in its Platonic sense can be found in *Irene overo della belezza* (1599) by MIHO MONALDI (Dubrovnik, 1540–1592). (IM) #19.4.21

DADIĆ, ŽARKO. 1992. The achievements of the CROATIAN JESUITS IN THE NATURAL SCIENCES. [In Croatian] Pp. 18–25 in #19.4.45. Discusses the scientific contributions and activities of MARKO ANTUN DOMINIS (1560–1624), IVAN VREMAN (1583–1620), RAFAEL PRODANELLI (1616–1694), MIHAEL LIPŠIĆ (1703–1765), JOSIP ZANCHI (1720–1786), RUGJER BOŠKOVIĆ (1711–1787), IVAN LUKA ZUZORIĆ (1716–1746), ANTUN RADIĆ (1726–1773), LUDWIG MITTERPACHER (1734–1814), JOSIP MITTERPACHER (1739–1788), FRANJO BRUNA (1745–1819), FRANJO STAINDL (1746–1818), and JOSIP FRANJO DOMIN (1754–1819). (IM) #19.4.22

DAVIES, PAUL. 1989. *The new physics.* Cambridge: Cambridge Univ. Press. ix + 516 pp. Hardbound; $59. Reviewed by Philip W. Anderson in *The Mathematical Intelligencer* **14**(1) (1992), 70–71. The reviewer implores historians of science to view the multiple revolutions that have taken place in PHYSICS since 1930 as importantly as the discoveries in relativity that culminated in the work of Bohr and Einstein. (DEZ) #19.4.23

DE, KRISHNA, AND DE, S. S. 1990. Numerals in Vedic literature. *News Bulletin of the Calcutta Mathematical Society* **13**(6), 5–8. INDIA. (RCG) #19.4.24

DIMITRIĆ, RADOSLAV. 1992. Anatoly Ivanovich Maltsev. *The Mathematical Intelligencer* **14**(2), 26–30. A biographical sketch of ANATOLY IVANOVICH MALTSEV (1909–1967), with short descriptions of his contributions to ALGEBRAIC SYSTEMS, LIE GROUPS, and TOPOLOGICAL ALGEBRAIC SYSTEMS. Photo. (DEZ) #19.4.25

DOROFEVVA, A. B. 1989. The implicit function theorem and its relation to the theory of optimization problems. [In Russian] Pp. 34–44 in #19.4.5. The history of the IMPLICIT FUNCTION THEOREM reveals that its content underwent several changes, from its inception in the 17th century, through the work of WEIERSTRASS and JORDAN in the 19th century, to the work of DINI and OSGOOD in the 20th century. The paper ends with a description of the role of the theorem in functional analysis following a thread begun by Lagrange. REAL ANALYSIS. (DEZ) #19.4.26

DROGUETT, MANUEL BARAHONA. 1990. Matemáticas e historia de las matemáticas: El número pi, siete mil años de misterio [Mathematics and history of mathematics: the number PI, seven thousand years of mystery]. Pp. 283–293 in #19.4.110. An overview of the history of π, from its inception about 5000 B.C. to the proof of its transcendental nature by Lindemann in A.D. 1882. (DEZ) #19.4.27

DUGAC, PIERRE. 1991. *Histoire de la notion de limite des indivisibles aux infinitésimaux* [*History of the notion of limit from indivisibles to infinitesimals*]. Paris: Université Pierre et Marie Curie. Paperbound. 197 pp. Notes from a course on the history of LIMITS held February 1990–January 1991, including copies of two exams. The material covers contributions from ancient Babylon and Greece, the theory of series from Oresme and Stevin, and various works from the 17th century, including well-known figures such as Galileo, Cavalieri, Fermat, Newton, and Leibniz as well as those not so well known, such as Luca Valerio (1552–1619) and André Tacquet (1612–1660.) (DEZ) #19.4.28

DUGAC, PIERRE. *See also* #19.4.38.

ECCARIUS, WOLFGANG. 1992. Annual meeting of the Deutsche Mathematiker-Vereinigung. *Historia Mathematica* **19**(2), 210. A list of lecturers, with titles of their presentations, from a meeting of the "History of Mathematics" section of the Deutsche Mathematiker-Vereinigung held September 16–20, 1991, in Bielefeld, Germany (DEZ) #19.4.29

EDWARDS, HAROLD M. 1992. Mathematical ideas, ideals, and ideology. *The Mathematical Intelligencer* **14**(2), 6–19. The author's book *Divisor theory* (*see* #18.3.27) described the ideal prime factors of cyclotomic integers introduced in 1846 by ERNST EDUARD KUMMER. This paper complements the book by describing the way Kummer chose to present the main idea and the ways that LEOPOLD KRONECKER and RICHARD DEDEKIND modified and reformulated it. (DEZ) #19.4.30

ELESOURNE, J., AND ARMAND, R. 1991. A brief history of the first decade of SEMA. *Annals of the History of Computing* **13**, 341–349. A history, by a former chief executive officer and a general manager, respectively, of the Société de Mathématiques Appliquées, founded in 1958. It is an example in FRANCE of a corporate enterprise designed to bring scientific principles to bear on MANAGERIAL PROBLEM-SOLVING. The name was eventually extended to Société d'Economie de Mathématiques Appliqués (SEMA). The term "informatique" was coined by SEMA vice president Philippe Dreyfus to use in the name of a subsidiary service bureau in 1962, the Société d'Informatique Appliquée. The SEMA group of companies played an important role in the French NATIONAL PLANNING for the use of COMPUTERS, the Plan Calcul, in the late 1960s. (ACL) #19.4.31

ERNEST, PAUL. *See* #19.4.98.

FALKENSTEIN, LUDWIG. *See* #19.4.13.

FERNÁNDEZ, EDWIN CASTRO. 1990. Problemas matemáticos célebres: La duplicación del cubo y la raíz cúbica (Famous mathematical problems: The duplication of the cube and the cube root.) Pp. 304–314 in #19.4.110. A historical synthesis of the DUPLICATION OF THE CUBE and the cube root. The

constructibility of the number $\sqrt[3]{2}$ and the proof of the impossibility of solving the classical problem of antiquity by Wantzel. Several approximate geometrical solutions, one by Descartes in detail. (DEZ) #19.4.32

FOMENKO, A. T., KALASHNIKOV, V. V., AND NOSOVSKII, G. V. 1989. When was Ptolemy's star catalogue in *Almagest* compiled in reality? Statistical analysis. *Acta Applicandae Mathematicae* **17**, 203–229. The authors propose a statistical and geometrical method for determining the dating of PTOLEMY's star catalogue making use of catalogues of known dates such as those by Ulugbek and Tycho de Brahe. Reviewed by R. Rashed in *Zentralblatt* 696:01002. (ACL) #19.4.33

FRANKLIN, JAMES. 1991. The ancient legal sources of seventeenth-century probability. Pp. 123–144 in Stephen Gaukroger (Ed.), *The uses of antiquity*, Kluwer Academic Publishers. An examination of the preparatory elements involved in the development of PROBABILITY in the 17TH CENTURY. The author considers two kinds of probability, factual and logical, separately under ROMAN LAW from 150 A.D. to the early 1600s. LEIBNIZ is seen as a representative of the fusion of the two probabilities (DEZ) #19.4.34

FRANUŠIĆ, BORIS. 1992. Franjo Ksaver Orlando, the founder of the first public nautical schools on the Adriatic coast. [In Croatian] Pp. 74–86 in #19.4.45. FRANJO KSAVER ORLANDO (1723–1784) founded the public NAUTICAL SCHOOLS in Trieste (1753) and Rijeka (1774), and wrote MATHEMATICAL TEXTBOOKS in arithmetic, algebra, geometry, and plane and spherical trigonometry for his students, kept now in manuscript form in the Library of the Nautical School in Trieste. (IM) #19.4.35

FREGUGLIA, P. 1989. Algebra and geometry in Viète. *Bollettino di Storia delle Scienze Matematiche* **9**, 49–90. [In Italian] VIÈTE's *Rhetica exegetica* presented in his *Isagoge* of 1591 was added as a third aspect of the analytical art whose classical aspects were Zetetike and Poristike. This provided a new link between algebra and geometry. Comparisons are made with Stevin, Bombelli, and Bonasoni. Reviewed by K. Reich in *Zentralblatt* 695:01006. (ACL). #19.4.36

GAVROGLOU, KOSTAS, AND CHRISTIANIDIS, JEAN. 1992. International Conference: Contemporary trends in the historiography of science. *Historia Mathematica* **19**(2), 205. A list of lecturers on the history and philosophy of mathematics, with titles of their presentations, from a conference held May 27–31, 1991, in Korfu, Greece. (DEZ) #19.4.37

GILAIN, CHRISTIAN (Ed.) 1992. *Cahiers du Séminaire d'Histoire des Mathématiques* **1** (2e Série). This volume begins a new series of this JOURNAL. It contains the texts of five papers presented on March 14, 1990, at a seminar on REAL ALGEBRAIC GEOMETRY. The paper by Hourya Sinaceur is abstracted separately. The table of contents of the first series of the journal, edited by Pierre Dugac from 1980 through 1991, lists all papers printed in the 12 volumes that were published. (DEZ) #19.4.38

GINDIKIN, S. G. *See* #19.4.11.

GOLDSTEIN, CATHERINE. 1992. On a seventeenth century version of the "Fundamental theorem of arithmetic." *Historia Mathematica* **19**(2), 177–187. In addition to summarizing the life of Jean Prestet (1648–1690), this paper examines the proof of the FUNDAMENTAL THEOREM OF ARITHMETIC that appeared in a book by Prestet in 1689 and draws conclusions based on the style of the writing in it. (DEZ) #19.4.39

GRATTAN-GUINNESS, I. 1992. The Babbage/Faraday bicentenary conference. *Historia Mathematica* **19**(2), 206–207. A list of speakers and titles of presentations on CHARLES BABBAGE from a conference held July 5–7, 1991, in Cambridge, England, to celebrate the bicentenaries of the births of Babbage and MICHAEL FARADAY. (DEZ) #19.4.40

GULIEVA, I. F. 1989. On the history of the problem of two fixed centers. [In Russian] Pp. 139–144 in #19.4.5. This article describes the origin of THE PROBLEM OF TWO FIXED CENTERS in CELESTIAL

MECHANICS. It discusses the discovery of the problem by L. Euler, an initial solution by C. Jacobi, and the state of the problem at the turn of the 20th century with K. SHARLE. The last section discusses generalizations by students at MOSCOW UNIVERSITY during the 1960s. (DEZ) #19.4.41

GUPTA, R. C. 1988. Volume of a sphere in ancient Indian mathematics. *Journal of the Asiatic Society* **30,** 77–111. GEOMETRY. INDIA. (RCG) #19.4.42

GUPTA, SAILESH DAS. 1990. The mathematical contributions of SIR ASUTOSH MUKHOPADHYAY. *News Bulletin of the Calcutta Mathematical Society* **13**(1), 1–11. (RCG) #19.4.43

HARTMANN-SCHMITZ, U. 1989. *Die Zahl Sieben im sunnitischen Islam: Studien anhand von Koran und Hadīt.* Frankfurt am Main: Peter Lang. 143 pp. DM 42.00. (Europäische Hochschulschriften, Reihe 27, Asiatische und Afrikanische Studien, **22**.) Also published as a dissertation at the University of Mainz, 1988. The number SEVEN in SUNNI ISLAM. The reviewer in *Zentralblatt* 696:01003, R. Rashed, points out that this is not intended to be a contribution to the history of mathematics but rather is relevant to the history of religion and to the interpretation of the Koran. (ACL) #19.4.44

HORVAT, VLADIMIR (Ed.). 1992. *The Jesuits among the Croats: Proceedings of the International Symposium "The contributions of the Jesuits in the religious, scientific, and cultural field among the Croats."* [In Croatian] Zagreb: Filozofsko-teološki institut Družbe Isusove. 482 + 28 pp. Bibliotheca Fontes et studia historiae Societatis Jesu inter Croatas 3. Contains the part "Philosophy and science." Articles by Žarko Dadić, Boris Franušić, and Stipe Kutleša are abstracted separately. (IM) #19.4.45

HØYRUP, JENS. 1990. PLATONISM or ARCHIMEDISM: On the ideology and self-imposed model of Renaissance mathematicians (1400–1600). [In Croatian] *Godišnjak za povijest filozofije* **8,** 114–149. Tradition of Archimedism: LEONE BATTISTA ALBERTI, LUCA PACIOLI, REGIOMONTANUS, LUCA VALERIO, PETRUS RAMUS, FRANÇOIS VIÈTE, and MARIN GETALDIĆ. A Croatian version of the paper abstracted in #18.2.45. (IM) #19.4.46

JANUSZ, G. J. *See* #19.4.81.

JHA, P. 1988. ALGEBRA and algebraic equations in ANCIENT INDIA. *Journal of the Asiatic Society* **30,** 112–118. (RCG) #19.4.47

JOSEPHY, MICHAEL. 1990. Comentarios sobre la traducción castellana de las *Disquisitiones Arithmeticae* [Comments on the Castilian translation of *Disquisitiones Arithmeticae*]. Pp. 315–319 in #19.4.110. The role of GAUSS in number theory, the history of the project to translate his DISQUISITIONES ARITHMETICAE into Castilian, begun in 1985, the use of $\TeX$, and the difficulties encountered. (DEZ) #19.4.48

KAHANE, JEAN-PIERRE. 1992. A partir et autour de Wiener. *Cahier du Séminaire d'Histoire des Mathématiques* **2,** 65–78. Selections from the life, work, and influence of NORBERT WIENER. Four major works from the period 1930–1934 are examined, dealing with harmonic analysis, Tauberian theorems, the Fourier integral, and Fourier transforms. (DEZ) #19.4.49

KALASHNIKOV, V. V. *See* #19.4.33.

KAPOVIĆ, MATO (Ed.). 1990. *Liber Statutorum civitatis Ragusii compositus Anno 1272.* Dubrovnik: Historijski arhiv. 547 pp. A reprint of the *Editio princeps* by Baltazar Bogišić and Konstantin Jireček in 1904 accompanied by the translation in Croatian by Mate Križman and Josip Kolanović and the introduction by Ante Cvitanić. A statute of DUBROVNIK composed in 1272 contains precepts regarding

MEASUREMENT in that 13TH CENTURY city: pondering of the goods, oath of the supervisor of the weights and measures, the reconstruction of the streets and houses after the fire with defined length and breadth, sanctions against the use of wrong measures, and the justification of the measures with

the help of the official measures every year. "Index nominum et verborum novus ab editoribus adjectus," pp. 494–532, includes names of the old measures in Dubrovnik. (IM) #19.4.50

KENNEY, E. 1989. Cardano: "Arithmetic subtlety" and impossible solutions. *Philosophia Mathematica* II, Ser. 4, No. 2, 195–216. A summary of CARDANO's work in the 16th century that gave COMPLEX NUMBERS a more explicit mathematical role than hitherto. The author addresses the question of how relevant Cardano's interpretation of complex numbers is for later work on algebraic structures. Reviewed by W. Kaunzner in *Zentralblatt* 696:01004. (ACL) #19.4.51

KHAN, M. S. 1988. Teaching of mathematics and astronomy in educational institutions of medieval India. *Journal of the Asiatic Society* **30,** 144–155. EDUCATION IN MEDIEVAL INDIA. (RCG) #19.4.52

KNOBLOCH, EBERHARD. 1990. L'infini dans les mathématiques de Leibniz. Pp. 33–51 in *L'infinito in Leibniz: Problemi e terminologia* (Rome: Edizioni dell'Ateneo.) An examination of two of the three degrees of INFINITY studied by G. W. LEIBNIZ. The author discusses Leibniz's presuppositions, his notions of the infinite and the infinitely small, calculations on these infinities, and the consistency of his explications. (DEZ) #19.4.53

KÖRNER, THOMAS W. 1992. Sets of uniqueness. *Cahier du Séminaire d'Histoire des Mathématiques* **2,** 51–63. An examination of the contributions to the analytic notion of SETS OF UNIQUENESS by B. Riemann, G. Cantor, D. E. Mensov, N. K. Bari, A. Rajchman, R. Salem, and A. Zygmund. Using this study as a guide, the author posits three reasons why mathematicians should support the history of mathematics. SET THEORY. MEASURE THEORY. DISTRIBUTION THEORY. (DEZ) #19.4.54

KOVALENKO, T. M. 1989. Materials for a scientific biography of G. N. Duboshin. [In Russian] Pp. 145–157 in #19.4.5. A brief biography of GEORGII NIKOLAEVICH DUBOSHIN (1904–1986) based on archival material, followed by an account of his work in CELESTIAL MECHANICS, a review of one of his papers by N. D. MOISEEVA, and descriptions of his work in education and in the stability theory of A. M. LYAPUNOV. (DEZ) #19.4.55

KUDRYASHOVA, L. V., AND STEPANOVA, L. A. 1989. Dmitrii Nikanorovich Goryachev (1867–1949). [In Russian] Pp. 158–165 in #19.4.5. A brief account of the life and scientific activities of DMITRII NIKANOROVICH GORYACHEV based on archival materials. He was a student of N. E. ZHUKOVSKII in MECHANICS. (DEZ) #19.4.56

KULLMAN, DAVID. 1992. HIMED 92. *International Study Group on the Relations Between the History and Pedagogy of Mathematics Newsletter* **26,** 6–8. Report of the History in Mathematics Education meeting held April 10–12, 1992, in Nottingham, England. Descriptions of several talks, a list of workshop presenters and their topics, and mention of two special events. EDUCATION. (DEZ) #19.4.57

KUTLEŠA, STIPE. 1992. Hydromechanical works of FRANJO BRUNA. [In Croatian] Pp. 97–108 in #19.4.45. Discusses four HYDROMECHANICAL MANUSCRIPTS of Franjo Bruna (Zagreb, 1745–Pest, 1817), kept now in the University Library in Budapest. (IM) #19.4.58

KUZICHEVA, Z. A. 1989. On the history of universal and existential quantifiers. [In Russian] Pp. 59–65 in #19.4.5. A sketch of the work of Aristotle, Leibniz, De Morgan, Frege, Schröder, and Peano in mathematical LOGIC. (DEZ) #19.4.59

LAL, R. S. 1988. Jagadguru Swami Bhāratī and his novel methods of solving simple equations. *Journal of the Asiatic Society* **30,** 172–181. JAGADGURU SWAMI BHĀRATĪ. ALGEBRA. (RCG) #19.4.60

LIONS, JACQUES-LOUIS. 1991. De la machine à calculer de Pascal aux ordinateurs. *Comptes Rendus de l'Academie des Sciences. Série Générale, La Vie des Sciences* **8**(3), 221–240. BLAISE PASCAL's invention in 1642 of his calculating machine, la Pascaline, was followed by similar devices by others. Brief descriptions with photographs are given of Leibniz's competing machine of 1671, and of the

machines of Pasteur Hahn (1792) and Docteur Roth (1841). The claim is made by the author that these devices, as well as those of Charles Babbage in the late 19th century, found no broad usefulness and that it was only when parallel developments in logic and electric circuitry came together in the 20th century that the modern COMPUTER could be developed. A paragarph or two each is devoted to the role of Vito Volterra, Alan Turing, Hermann Goldstine, and John von Neumann. (ACL) #19.4.61

LOEFFEL, HANS. 1989. Abraham De Moivre (1667–1754). Pionier der stochastischen Rentenrechnung. *Mitteilungen der Vereinigung schweizerische Versicherungsmathematiker* No. **2,** 217–228. ABRAHAM DE MOIVRE as a pioneer of stochastic CALCULATION OF ANNUITIES. I. Schneider in his review in *Zentralblatt* 695:01015 lists deficiencies in the work. (ACL) #19.4.62

LOHRMANN, DIETRICH. *See* #19.4.13.

LÜTZEN, J. *See* #19.4.6.

MACKEY, GEORGE W. 1992. Harmonic analysis and unitary group representations: The development from 1927 to 1950. *Cahier du Séminaire d'Histoire des Mathématiques* **2,** 13–42. An account of infinite dimensional GROUP REPRESENTATIONS and their irreducible constituents from two 1927 papers by Hermann Weyl to the classic paper of Harish-Chandra, including its five-column review by R. Godement in 1951. The author divides the study into three nondisjoint periods, the first beginning with the construction of Haar measure in 1933, the second being a period of transition during World War II, and the third being the postwar period 1947–1950 that saw a systematic treatment of the general case by six different contributors. (DEZ) #19.4.63

MAJUMDAR, P. K. 1988. Bhāskarācārya II and transformation of sum and difference into product. *Journal of the Asiatic Society* **30,** 77–111. INDIA. (RCG) #19.4.64

MALLIAVIN, PAUL. 1992. Mesures invariantes et mesures quasi-invariantes. *Cahier du Séminaire d'Histoire des Mathématiques* **2,** 43–49. A survey of developments in INVARIANT MEASURES and quasi-invariant measures during the period 1925–1955, beginning with the definition of an invariant integral on COMPACT LIE GROUPS BY Elie Cartan. (DEZ) #19.4.65

MALYSHEV, V. A. 1989. The philosophy of large systems and traditional mathematics. [In Russian] Pp. 75–83 in #19.4.5. A discussion of three principles that are necessary for future mathematical theories of LARGE SYSTEMS. Some popular modern theories (like statistical mechanics, statistical quantum field theory, and general systems theory) are then discussed in this context. (DEZ) #19.4.66

MALYX, A. E. 1989. The combinatorial heritage of LEONHARD EULER. [In Russian] Pp. 66–74 in #19.4.5. The author shows that Euler's investigations played a leading role in the development of COMBINATORICS by posing concrete problems and introducing basic notions. He also describes Euler's role in creating a combinatorial theory of Latin squares and solving problems concerned with "partitio numerorum." (DEZ) #19.4.67

MARCHISOTTO, ELENA ANNE. 1992. Mathematics resource library at California State University, Northridge. *International Study Group on the Relations Between the History and Pedagogy of Mathematics Newsletter* **26,** 8. Description of the holdings in the RESOURCE LIBRARY at California State University at Northridge. (DEZ) #19.4.68

MEDVEDEV, F. A. 1989. The horn-like angles in Ash-Shirazi's *Commentaries*. [In Russian] Pp. 84–92 in #19.4.5. An analysis of the work on horn-like angles by the 13th century, Central Asian mathematician, ASH-SHIRAZI. (DEZ) #19.4.69

MORA-CHARLES, M. S. DE. 1992. Quelques jeux de hazard selon Leibniz (Manuscrits inédits). *Historia Mathematica* **19**(2), 125–157. Explication of three unpublished manuscripts by G. W. LEIBNIZ on GAMES OF CHANCE. The manuscripts, written between 1678 and 1698, examine the rules of fifty-and-nine, solitaire, and productions, and suggest variations of them. PROBABILITY. (DEZ) #19.4.70

MURILLO, MARIO. 1990. Elementos de aritmética maya [Elements of MAYAN ARITHMETIC]. Pp. 320–329 in #19.4.110. An account of the Mayan culture including a description of its number system and the operations of addition and multiplication. (DEZ) #19.4.71

NOSOVSKII, G. V. *See* #19.4.33.

OLEKHNIK, S. N. 1989. Recreational problems in Russian literature in the 19th century. [In Russian] Pp. 93–102 in #19.4.5. Examples of problems in RECREATIONAL MATHEMATICS taken from books and journals in RUSSIA, from an 1844 book of Butler to two works by Obreimov in 1889. (DEZ) #19.4.72

PARSHALL, KAREN V. H. 1992. The 100th anniversary of mathematics at the University of Chicago. *The Mathematical Intelligencer* **14**(2), 39–44. The author recounts the founding of the department of mathematics at the UNIVERSITY OF CHICAGO in 1892. She describes the search by E. H. MOORE for a faculty satisfying exacting standards of scholarship that landed OSKAR BOLZA and HEINRICH MASCHKE. The imprint of FELIX KLEIN is unmistakable. AMERICAN MATHEMATICS. (DEZ) #19.4.73

PEPE, LUIGI. 1992. European mathematics during the XVth century. *Historia Mathematica* **19**(2), 205–206. A list of lecturers, with titles of their presentations, from a symposium held June 24–28, 1991, in Cortona, Italy, on recent studies in European mathematics during the 15TH CENTURY. (DEZ) #19.4.74

PETROVA, S. S. 1989. The Euler–Maclaurin summation formula and asymptotic series. [In Russian] Pp. 103–108 in #19.4.5. The development of methods for approximating a sum $\Sigma_{k=0}^{n} f(k)$ by a series involving certain integrals and Bernoulli numbers in a work of Euler from 1749, but not published until 1768. REAL ANALYSIS. (DEZ) #19.4.75

PIER, JEAN-PAUL. 1992. De l'analyse de Fourier á l'analyse harmonique. *Cahier du Séminaire d'Histoire des Mathématiques* **2**, 1–11. An overview of the origins of HARMONIC ANALYSIS, beginning with the work of FOURIER but emphasizing the role played by N. Wiener, A. Haar, L. Pontrjagin, A. Weil, H. Cartan, R. Godement, I. Gelfand, and D. Raikov. The author emphasizes that abstract harmonic analysis follows two separate paths, one toward abstraction and the other toward the concrete realization of abstract mathematical objects by REPRESENTATIONS. (DEZ) #19.4.76

PIER, JEAN-PAUL (Ed.) 1992. L'émergence de l'analyse harmonique abstraite (1930–1950). *Cahier du Séminaire d'Histoire des Mathématiques* **2**, 1–78. This special edition of the journal presents the texts of six papers delivered at a conference held March 13, 1991, in Paris. It is devoted to the emergence of ABSTRACT HARMONIC ANALYSIS in the period 1930–1950, when the subject evolved toward more abstraction. Papers by J.-P. Pier, George W. Mackey, Paul Malliavin, Thomas W. Körner, and J.-P. Kahane are abstracted separately. (DEZ) #19.4.77

PROTASOVA, L. A. 1989. On the formation of wing theory in Soviet educational literature. [In Russian] Pp. 166–177 in #19.4.5. An examination of the early work in RUSSIA on WING THEORY, especially the books by V. V. GOLUBEV in 1927, 1931, and 1949. (DEZ) #19.4.78

RADVANSKY, SUSAN. *See* #19.4.91.

RAGHAVAN, K. 1990. The Suksma value of π. *The Mathematics Education* **24**, 66–69. PI. INDIA. (RCG) #19.4.79

RAKESH, MOHAN. 1988. As Europe emerged from dark age—Life and struggle of KEPLER. *Mathematics Today* **6**(1), 11–16. (RCG) #19.4.80

REINER, IRVING. 1989. *Selected works*. Urbana, IL: University of Illinois Press. xxvi + 787 pp. $70.00. Edited with a preface by G. J. Janusz. Forty-eight papers, mainly relating to groups of invertible MATRICES over integral domains and their automorphisms and REPRESENTATION THEORY. The collec-

tion includes a biography and complete bibliography of Reiner's works. IRVING REINER. *Zentralblatt* 695:01022. (ACL) #19.4.81

RICKEY, V. FREDERICK. 1992. HPM in Nashville. *International Study Group on the Relations Between the History and Pedagogy of Mathematics Newsletter* **26,** 4–6. Report of a meeting of the Americas Section of HPM held April 2–4, 1992, in Nashville. Abstracts of five papers. (DEZ) #19.4.82

RYBNIKOV, K. A. 1989. Outline of the history of graph theory. [In Russian] Pp. 109–122 in #19.4.5. The history of GRAPH THEORY from a letter of Leibniz to Huygens in 1679 to the 19th century work of Kirchhoff, including Euler's Königsberg bridge problem and the contributions of Vandermonde, Goldbach, Legendre, Kirkman, Hamilton, Veblen, Kuratowski, Listing, and Cayley. Even Karl Marx's "Mathematical manuscripts" merits attention. (DEZ) #19.4.83

RYBNIKOV, K. A. *See also* #19.4.5.

SCHREIBER, PETER. 1992. Fourteenth meeting of the Study Group "History, Philosophy and Foundations of mathematics." *Historia Mathematica* **19**(2), 209–210. A list of lecturers, with titles of their presentations, from a meeting held October 14–16, 1991, in Gosen (near Berlin). This was the first meeting of the "History of Mathematics" section within the Deutsche Mathematiker-Vereinigung. (DEZ) #19.4.84

SCHUBRING, GERT. 1990. Les échanges entre les mathématiciens Français et Allemands sur la rigueur dans les concepts d'arithmétique et d'analyse. Pp. 89–104 in *Actes du 144e Congrès National des Sociétés Savantes* (Paris: Éditions du CTHS.) Text of a paper delivered at the 144th National Congress of Learned Societies whose theme was "Exchanges of scientific and technical influences between European countries from 1780 and 1830." This paper considers various exchanges, principally correspondence, visits, and translations, between FRANCE and GERMANY in this period. It considers differences in rigor regarding the acceptance of negative numbers, the concepts of infinity and the infinitely small, and combinatorial analysis. The author concludes that the exchanges contributed a great deal to the development of mathematics. (DEZ) #19.4.85

SHUCHUN, GUO. 1992. Guo Shuchun's edition of the *Jiu Zhang Suan Shu*. (Nine chapters of the mathematical art.) *Historia Mathematica* **19**(2), 200–202. A description of the background, contents, and importance of the 1990 edition of the *Jiu Zhang Suan Shu* by GUO SHUCHUN. CHINA. (DEZ) #19.4.86

SINACEUR, HOURYA. 1992. Préhistoire de la géometrie algébrique réele; de Descartes à Tarski. Pp. 1–17 in #19.4.38. An overview of the prehistory of REAL ALGEBRAIC GEOMETRY, beginning with DESCARTES' rule of signs, including extensions by FOURIER and STURM, and ending with the independent discovery by ALFRED TARSKI in a completely different context. Tarski's method of elimination of quantifiers is elucidated in a historical context. (DEZ) #19.4.87

SINGH, N. 1988. JAIN theory of actual infinities and transfinite numbers. *Journal of the Asiatic Society* **30,** 77–111. Examination of INFINITY in INDIA. (RCG) #19.4.88

SINGH, S. N. 1990. Mathematics in ANCIENT HINDU religion. *News Bulletin of the Calcutta Mathematical Society* **13**(3), 5–7. (RCG) #19.4.89

SMIRNOVA, G. S. 1989. Geometric solutions of cubic equations in the *Algebra* of Rafael Bombelli. [In Russian] Pp. 123–129 in #19.4.5. An explication of the "dimostratione generalissima" from the *Opera su l'Algebra* (1572) of RAFAEL BOMBELLI. The author explains why one case should be solved in the plane instead of in space. (DEZ) #19.4.90

SMITH, GORDON C., RADVANSKY, SUSAN, AND CHIBA, MARTA. 1992. *History of mathematics and related sciences: An annotated bibliography of sources held by Monash University Library*. Clayton: Monash University Department of Mathematics and Monash University Library. xix + 281 pp.

Paperbound, $15 Australian. Edited by J. N. Crossley. An annotated BIBLIOGRAPHY of original works, facsimiles, translations, popularizations, biographical works, and bibliographical works, written before 1851, housed in the Hargrave Library at Monash University. The main strength of the collection surrounds the work of ISAAC NEWTON, but it includes the first English translations of some Chinese works from 1300. (IGG) #19.4.91

STEPANOVA, L. A. *See* #19.4.56.

STIGLER, STEPHEN M. 1988. The dark ages of probability in England: The SEVENTEENTH CENTURY work of Richard Cumberland and Thomas Strode. *International Statistical Review* **56**(1), 75–88. A review of work done in ENGLAND on PROBABILITY during the period between Pascal and Bernoulli. It is shown that RICHARD CUMBERLAND introduced the criterion of maximizing expected utility in a nonmathematical treatise published in 1672, and that THOMAS STRODE derived the distribution of the total thrown for an arbitrary number of dice in a treatise of 1678 on combinatorics. (DEZ) #19.4.92

STIGLER, STEPHEN M. 1992. *Apollo Mathematicus:* A story of resistance to quantification in the seventeenth century. *Proceedings of the American Philosophical Society* **130**(1), 93–126. An account of the tension between those who prefer quantitative analysis and those who prefer qualitative analysis in PROBABILITY. This present-day tension is exemplified in events surrounding the 1695 book *Apollo Mathematicus* by the English physician EDWARD EIZAT, who attacked the views of the Scottish physician ARCHIBALD PITCAIRNE, whose own retort was carried out by his student, GEORGE HEPBURN. (DEZ) #19.4.93

SUNGURTSEV, YU. V. 1989. The importance of the doctoral dissertation of S. A. CHAPLYGIN in the history of the formation of modern GAS JET THEORY. [In Russian] Pp. 178–183 in #19.4.5. An analysis of the fundamental importance of Chaplygin's work *Gas jets* (1902) in the subsequent development of compressible flow dynamics. There are brief descriptions of other papers in the field. (DEZ) #19.4.94

SWETZ, FRANK. 1992. Learn from the Masters! *International Study Group on the Relations Between the History and Pedagogy of Mathematics Newletter* **26,** 9–10. Report of a conference/workshop held in August, 1988, in Kristiansand, Norway, on the use of the history of mathematics as a pedagogical tool in the teaching of mathematics. The title of the report refers to the title of the proceedings of the conference, published by the Pennsylvania State University. EDUCATION. (DEZ) #19.4.95

SWETZ, FRANK J. 1992. The International Conference on the History of Mathematics and EDUCATION in History of Mathematics. *Historia Mathematica* **19**(2), 207. A list of lecturers, with titles of their presentations, from a conference held August 9–14, 1991, in Baotou, Inner Mongolia. (DEZ) #19.4.96

TARANOVSKAYA, T. D. 1989. The theory of determinants in the works of 19th century Russian mathematicians. [In Russian] Pp. 130–138 in #19.4.5. This article aims to fill in the literature on the history of DETERMINANTS by considering the first RUSSIAN contributions to the subject. It begins with a chapter from an 1834 monograph of N. I. LOBACHEVSKII, then considers three works from an intense period 1862–1877 by A. K. ZHBIKOVSKII, D. M. DELARYU, and M. E. VASHCHENKO-ZAKHARCHENKO. (DEZ) #19.4.97

THOMAS, ROBERT, AND ERNEST, PAUL. 1992. Second International History, Philosophy, and Science Teaching Conference. *International Study Group on the Relations Between the History and Pedagogy of Mathematics Newsletter* **26,** 12. Report on a meeting held May 11–15, 1992, in Kingston, Ontario. EDUCATION. (DEZ) #19.4.98

TRUPANOVA, V. M. *See* #19.4.1.

TSIJLI, THEODORA. 1990. Sofía Kovalevskaia. Cien años de su muerte [Sofía Kovalevskaya. One hundred years from her death]. Pp. 340–347 in #19.4.110. Homage to the first woman doctorate in

mathematics, SOFÍA KOVALEVSKAYA, including the academic obstacles she faced. Kovalevskaya's situation is contrasted with the present situation in Costa Rica. (DEZ) #19.4.99

TYULINA, I. A. 1989. On the substance of Newton's mechanics (on the tricentennial of the *Principia*). [In Russian] Pp. 184–196 in #19.4.5. A 300-year salute to the publication of the *Principia* by ISAAC NEWTON, emphasizing its MECHANICS. (DEZ) #19.4.100

TYULINA, I. A. *See also* #19.4.5.

UNNI, K. R. 1989. Mathematical Research in INDIA. *News Bulletin of the Calcutta Mathematical Society* **12**(8/9), 10–15. (RCG) #19.4.101

VARGAS, CELSO. 1990. La aplicación del algoritmo de unificación en el contexto del método de Robinson [An application of the algorithm of unification in the context of Robinson's method and some theories of LINGUISTICS]. Pp. 443–452 in #19.4.110. From the English summary: "Unification is the subject of constant research in different fields, including LOGIC PROGRAMMING, many sorted equations, problem solving, parallel execution of logic programs, and linguistics. This report attempts to describe the central role of UNIFICATION in important contemporary syntactic theories and formalisms." J. J. ROBINSON. (DEZ) #19.4.102

WILSON, ROBIN. 1992. Polish mathematics. *The Mathematical Intelligencer* **14**(2), 80. Stamps from 1982 commemorating the International Congress of Mathematicians and honoring the POLISH MATHEMATICIANS Stanislaw ZAREMBA, Waclaw SIERPÍNSKI, Zygmunt JANISZEWSKI, and Stefan BANACH. (DEZ) #19.4.103

YOUNG, GREGG DE. 1992. Isḥāq ibn Ḥunayn, Ḥunayn ibn Isḥāq, and the third Arabic translation of Euclid's *Elements*. *Historia Mathematica* **19**(2), 188–199. A survey of available ARABIC TRANSLATIONS of Euclid's *Elements* that describes the patterns of ascriptions by several translators. The author concludes that "Isḥāq ibn Ḥunayn was the principal, if not the only, translator involved in creating the surviving Arabic translation of the *Elements* which now exists in several distinct versions." GREEK GEOMETRY. (DEZ) #19.4.104

ZAIDULLINA, I. I. 1989. Bhaskara and his works. [In Russian] Pp. 45–49 in #19.4.5. An analysis of the relation of the works of two Indian mathematicians, BHASKARA and ARYABHATA, on INDETERMINATE EQUATIONS and TRIGONOMETRY. (DEZ) #19.4.105

ZAITSEV, E. A. 1989. G. Peano on the concept of "the" and on the possibility of eliminating it from a theory. [In Russian] Pp. 50–58 in #19.4.5. The origin and development of the distinction between an element and a class consisting of that element in the logic of GIUSEPPE PEANO. LOGIC. (DEZ) #19.4.106

ZENKO, FRANJO. 1989. Meršić's understanding and definition of philosophy. [In Croatian] *Prilozi za istraživanje hrvatske filozofske baštine* **15**, 149–160. Discusses the philosophical meaning of *Organistik der Geometrie: Grundzüge der geometrischen Prinzipiumlehre im Gegensatz zur euklidischen und nichteuklidischen Kasuistik* (1914), the main work by MATE MERŠIĆ MILORADIĆ (1850–1928), Croatian philosopher, theologian and poet from Burgenland (Austria). Theory of science as VERNUNFTALGORITHMIK. EUCLID. (IM) #19.4.107

ZÚÑIGA, ANGEL RUIZ. 1990. Epistemología y ciencia en la antiguedad: El caso des epicureismo [EPISTEMOLOGY and science in antiquity: The case of the EPICURISM]. Pp. 433–442 in #19.4.110. A description of the principal ideas of Epicurus concerning science and knowledge as contrasted with the STOICS, as they apply to LOGIC and mathematics. (DEZ) #19.4.108

ZÚÑIGA, ANGEL RUIZ. 1990. Sobre la revolución científica y matemática del siglo XVII [On the scientific and mathematical revolution of the 17th century]. Pp. 330–339 in #19.4.110. The roles played by Galileo, Harvey, Descartes, Fermat, and Newton in the scientific revolution of the 17TH CENTURY that transformed scientific thought to its modern western model. (DEZ) #19.4.109

ZÚÑIGA, ANGEL RUIZ (Ed.) 1990. *Las matemáticas en Costa Rica* [Mathematics in COSTA RICA]. San José: Departamento de Publicationes, Universidad Nacional. Paperbound. x + 533 pp. Proceedings of the Third National Congress of Mathematics, held October 15–19, 1990, in San José, Costa Rica. The Congress represented a continuation of the first two congresses held in 1983 and 1985. The text is divided into nine sections. Relevant papers from the sections on "The history of mathematics," "The history of mathematics and physics in Costa Rica," and "The history, methodology, and philosophy of science" are abstracted separately. (DEZ) #19.4.110

ZÚÑIGA, ANGEL RUIZ. *See also* #19.4.14 and #19.4.15.